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ALBERTA'S ADVANCED  
TECHNOLOGY SECTOR  
An Investment Perspective

# ALBERTA'S ADVANCED TECHNOLOGY SECTOR

## An Investment Perspective

Alberta Economic Development & Trade  
Investment Branch

October, 1992





# **ALBERTA'S ADVANCED TECHNOLOGY SECTOR**

## **An Investment Perspective**

*The Investment Branch of Alberta Economic Development and Trade is pleased to present "Alberta's Advanced Technology Sector: An Investment Perspective". It is intended to inform potential investors about the rapidly expanding advanced technology industries in the province.*

*Alberta has consistently been one of the most attractive Canadian provinces for investment. Indeed, since 1985, it has benefited from the highest per capita level of investment of all provinces. Alberta's myriad of advantages -- like its abundance of natural resources: oil, natural gas, agricultural land, forests, etc. and its young, well educated and productive workforce -- are just some of the reasons why investors from around the world choose Alberta.*

*Alberta has been successful not only in attracting direct investment and international technology and expertise, but also partners for strategic alliances with Alberta companies.*

*It is hoped that this document will give further insight into Alberta's economy and that it will encourage you to explore the array of advanced technology opportunities available in the province.*

*For more information on the sector or for details on specific investment opportunities, please contact:*

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# **ALBERTA'S ADVANCED TECHNOLOGY SECTOR**

## **An Investment Perspective**

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## 1.0 INTRODUCTION

In today's fast-paced, technologically-oriented world, scientific research and technology development have become essential to economic prosperity and a higher quality of life.

The province of Alberta has taken a particularly active role in encouraging scientific research and development, not only within its boundaries, but across Canada and elsewhere in the world.

This paper provides an outline of the key considerations for technology intensive investment in Alberta. It gives an overview of the research and technology development network in Alberta and how it is supported through the cooperation of industry, the scientific and educational communities, and government. Examples are provided of cooperative private and public sector research efforts and their accomplishments in key areas such as energy, agriculture, forestry, medicine and emerging technologies. These examples were selected to demonstrate the quality of research and technology development in Alberta and the calibre of the people who are choosing this province in which to undertake creative and productive research.

## 2.0 ALBERTA ADVANTAGE

### 2.1 The Province

The westernmost of Canada's three prairie provinces, Alberta lies between the 49th and 60th parallels, virtually the same latitudes as those bounding the United Kingdom. With a population of 2.5 million, Alberta covers 661,185 square kilometres, one fifteenth of the total land area of Canada. Alberta became a province in Canada in 1905 with Edmonton as the capital. Its major centres of Edmonton and Calgary rank, respectively, the fourth and fifth largest cities in Canada.

Alberta's strong and diversified economy is shaped by energy wealth, rich forests and lands, abundant fresh water, and physical beauty. In addition, Alberta is well positioned to access the Western Canadian and northwestern United States markets. Among all major distribution centres in Western Canada, Calgary and Edmonton provide the best access at the lowest cost to the western provinces, northern Canada, the Pacific Northwest, California, and the Midwest states.

### 2.2 The Economy

One of the most dynamic business regions in North America, Alberta offers superb prospects for trade and investment. With a gross domestic product (GDP) estimated at \$73.5 billion (1991), the province has the fourth largest economy in Canada.

Alberta will have one of the highest economic growth rates among all the provinces, between 2 per cent and 3.4 per cent in 1992, and 2.3 per cent to 4.3 per cent in 1993. Alberta created some 14,600 jobs in 1991, compared to a loss of 232,000 in Canada as a whole.

#### CURRENT ECONOMIC INDICATORS

	Reference Period	Canada	Alberta	Ontario	B.C.
Population (thousands)	6/91	26,992	2,522	9,906	3,213
GDP at Market Prices (Millions)	'90	\$678,985	\$72,580	\$281,210	\$81,085
Per Capita GDP	'90	\$25,524	\$29,361	\$28,862	\$25,934
Exports (millions excluding services)	'90	\$146,057	\$15,622	\$117,608	n/a
Per Capita Personal Income	'90	\$22,184	\$21,972	\$25,151	\$22,437
Per Capita Investment	'91	\$6,616	\$8,946	\$6,915	\$7,014
Per Capita Retail Trade	11/91	\$577	\$641	\$590	\$623
Labour Force Participation Rate (%)	'91	66.3	72.5	68.3	66.4
Consumer Price Index (1986 = 100)	12/91	126.4	124.9	127.7	124.0
Unemployment Rate	3/92	12.5	10.1	11.7	11.3

Source: Alberta Bureau of Statistics and various other sources



### 3.0 ALBERTA INVESTMENT STRENGTHS

Albertans are among the best educated people in North America with more than one quarter of the population holding a post-secondary certificate, university degree, or a continuing education degree. The province has one of the youngest populations in the industrialized world with 74 per cent of the population under the age of 44. The province has Canada's highest labour force participation rate. Alberta consistently has one of the best labour records of any province in Canada in terms of fewest work-days lost due to strikes.

Albertans benefit from the lowest overall taxes in Canada.

- A general corporate tax rate of 15.5% applies to large corporations, while a rate of 6% applies to small businesses. In Canada, provincial rates are added to federal rates; therefore, the combined federal and provincial general rate is 43.5 per cent (28% + 15.5%).
- Alberta's personal income tax rates are the lowest in Canada.
- There are no general provincial capital nor payroll taxes, which are prevalent in many other provinces and the U.S.
- Alberta has one of the lowest provincial transportation fuel taxes in Canada.
- Alberta is the only province that does not have a provincial retail sales tax.

The Alberta Government has participated in several economic initiatives which, under appropriate circumstances, may provide financial assistance to research & development (R&D) ventures. These include:

**The Alberta Heritage Savings Trust Fund** was established with a \$12 billion endowment to provide financial support to various research agencies, research & development tax incentives and also to strengthen and diversify the Alberta economy.

**Alberta Opportunity Company** is a Crown Corporation that provides loans, loan guarantees and equity investment in certain sectors, including manufacturing and advanced technologies.

**Joint Venture Program** was initiated by the Alberta Research Council to undertake research with companies on an equally-shared joint venture basis.

**Farming for the Future** is a agricultural research program financed through the Alberta Heritage Savings Trust Fund. This was established to support the advancement of agricultural technology by augmenting and complementing research efforts by private industry, universities and government agencies.

#### 3.1 Human Resources

#### 3.2 Favourable Tax Regime

#### 3.3 Alberta Government Research & Development Incentives

### 3.4 Federal Government Research & Development Incentives

Canada offers one of the most favourable packages of R&D tax incentives of all industrialized nations. Canadian tax legislation contains special rules permitting the immediate deduction of almost all current and capital expenditures incurred on scientific research in Canada. A recent study has shown that the Canadian system provides domestic corporations with a significant cost advantage over American firms when competing for R&D in the U.S.

### 3.5 Environmental Protection

Alberta has been the leader in Canada in setting environmental policies. Alberta has recently passed a new comprehensive Environmental Protection and Enhancement Act. The basic principle of this Act is to ensure the protection, improvement and wise use of the environment in the 21st century.

The province's Energy Resources Conservation Board and the recently established Natural Resources Conservation Board ensure the responsible management and development of Alberta's renewable and non-renewable resources.



## 4.0 TECHNOLOGY INFRASTRUCTURE

The Alberta research and technology network comprises many corporations, institutions and private and public research agencies, as well as an impressive array of laboratory, testing and service facilities.

Private industry makes up the largest component of Alberta's research network. Technology intensive companies in Alberta spend about \$250 million per year on research related projects. Today, there are over 1,200 technology intensive companies employing over 50,000 people. Technology intensive industries are expected to account for nearly 25 per cent of the value of Alberta's manufacturing shipments by the year 2000.

Scientists at Alberta's universities are eager to work with the private sector to transfer new technologies from the laboratory to the market.

**University of Alberta (U of A)** located in Edmonton, has grown to become Canada's second largest university, with a student body of over 30,000. The university currently embraces more than 30 research-based institutes and employs more than 1,700 academics. The university has a long tradition of research excellence due to first-class research facilities as well as recruitment of talented scholars. The U of A's Intellectual Properties and Contracts Office is responsible for transferring university technologies to the private sector.

**The University of Calgary (U of C)** - The U of C's strong research orientation has led to the development of large concentrations of expertise in fields ranging from genetic engineering, biotechnology and cardiovascular research, to computing technologies and microelectronics. University Technologies International Inc. (UTI) is a subsidiary of the U of C, whose mandate is to transfer technologies and products developed at the university to the private sector.

The following are provincially-supported research centres in Alberta:

**Alberta Microelectronics Centre** located at the universities in Edmonton and Calgary, helps Alberta industry to develop and apply microelectronic technology to a variety of situations and uses. Research is product-oriented and includes work in areas such as micro-sensors.

**The Alberta Telecommunications Research Centre** located at the universities in Edmonton and Calgary, conducts and shares the benefits of its research among its university, government and industry sponsors. Its focus is on applied research in telecommunications.

### 4.1 Industry

### 4.2 Universities

### 4.3 Provincial Research Facilities

**The Alberta Research Council**, headquartered in Edmonton, is a Crown corporation that works closely with the universities and industrial clients to develop innovative technologies and transfer them to commercial use.

**The Electronics Test Centre** at the Alberta Research Council's Edmonton facility provides evaluation, testing and consulting services to electronics and telecommunications manufacturers to meet specified needs.

**The Alberta Heritage Foundation for Medical Research**, established in 1979 with an endowment of \$300 million, provides funds for new areas of basic and clinical research in Alberta's universities and hospitals.

**The Alberta Laser Institute**, the first centre of its kind in Canada, helps industry to develop and use laser systems as a cost-efficient production technique. It has locations in both Edmonton and Calgary.

**The Food Processing Development Centre**, located in Leduc, assists its members by giving them access to product development laboratories and a pilot plant for product simulation.

**The Centre for Frontier Engineering Research**, established in 1983, addresses engineering and other challenges related to cold weather development. It offers technical and consultative services and undertakes contract research for industry. Its \$18 million facility opened in 1990 in Edmonton.

**The Alberta Oil Sands Technology and Research Authority** based in Edmonton, pursues new technology for oil sands, heavy oil and conventional crude oil recovery. It also provides financial incentives to the private sector and research agencies to develop technologies in these areas.

**The University of Calgary's Cyber 205 Supercomputer Facility** is available to industry researchers in need of high speed supercomputer modelling and processing.

#### 4.4 Federal Research Agencies

The Canadian government is a major supporter of research and development in Alberta, through its research establishments in the province.

**National Research Council of Canada** provides direct financial and advisory assistance to industry.

**National Sciences and Engineering Research Council of Canada** funds universities towards research in natural sciences and engineering.

**Medical Research Council of Canada** provides grants and sponsors programs to help develop research in basic, applied, experimental or clinical research areas where major contributions may be expected.

## 5.0 EMERGING TECHNOLOGIES

Since 1983, the Alberta government has invested more than \$1.8 billion in promoting science and technology in areas where the industry has both a competitive edge and long range potential. The following is a profile of selected emerging technology emanating from Alberta.

For applications in the mining, manufacturing, and forestry industries, Alberta companies are innovative in developing new materials. The advanced materials industry has focused on opportunities in three areas: polymers, additives and modifiers, and industrial coatings. The \$140 million WESTAIM project is a joint industry/government initiative that has established a world scale research centre in advanced materials in Alberta.

### 5.1 Advanced Materials

In terms of sales, employment and diversity, electronics is the largest of the advanced technology industries in Alberta. Alberta's strength is in commercial electronics (eg. production of microchips, equipment monitoring and control devices, and navigation equipment). As well, non-resource commercial electronics products have been developed. For example, the University of Alberta is developing a laser for precision surgery.

### 5.2 Electronics

There are about 400 computing service companies including firms engaged in data processing and systems services. The software industry dominates the sector; there are 250 Alberta software companies employing some 5,000 people that have developed almost 900 types of software packages in four broad product categories: artificial intelligence/expert system software, industry-specific software, systems software and non-industry specific software. Total revenue generated by these firms directly from software product sales is estimated at \$80 million to \$120 million a year.

### 5.3 Information Technologies

Alberta has a world-class medical research community. The Alberta Heritage Foundation for Medical Research contributes about \$35 million a year to the research efforts of more than 150 scientists. The University of Calgary Cardiovascular Research group is one of the few in North America to cover the spectrum from the laboratory study of single heart cells to clinical research with cardiac patients.

### 5.4 Medical Research and Biotechnology

Alberta companies are noted for their innovation in telecommunications equipment and technology. Firms develop and market innovative products ranging from digital switching and translating equipment, to military command communications systems, to telephones that will not cause explosions around flammable materials. Other products are test measurement and control apparatus; subassemblies and sub-systems; and process automation equipment. The revenues from this industry exceeded \$1.2 billion in 1991.

### 5.5 Telecommunications



## 6.0 ALBERTA ADVANCED TECHNOLOGY ACCOMPLISHMENTS

Alberta's advanced technology companies are creating a dynamic environment, rich in opportunity. The following are just a few examples of technological accomplishments representing potential investment or strategic alliance possibilities.

### 6.1 Advanced Materials

#### Structural Ceramic Technology

ICS Inc., uses its unique structural ceramic technology to manufacture large, monolithic, complex and large custom shapes from high density alumina and alumina bonded silicon carbide using a special casting process. It also produces ceramic wear-resistant lining systems using the above technology. In addition to its industrial ceramic products, ICS produces monolithic compound curved ceramic plates used in hard armour systems. To date, these systems have been purchased for use by private police forces, military and private commercial agencies.

#### Advanced Composite Technology

EDO Canada Ltd.'s ceramic pilot plant in Calgary, develops advanced materials processes, manufacturing technologies, and fabrication and testing expertise. It utilizes High Pressure Injection Moulding (HPIM) technology to fabricate complex ceramic shapes that can replace a broad range of traditional materials. This technology optimizes the strength, hardness, and wear resistant physical properties of submicron ceramic powders such as alumina, stabilized zirconia, and silicon carbide.

### 6.2 Aerospace

#### Navigational and Meteorological Systems

Pelorus Navigation Systems Inc. of Calgary develops, manufactures and maintains navigational and meteorological systems for airports. One of the most advanced designs on the market, Pelorus offers "fail safe" circuitry and Remote Monitoring and Maintenance System (RMMS) capability for extended reliability and life cycle economics. Pelorus has a complete product line for both enroute and terminal navigation. Currently, the company is developing a precision model for use in conjunction with Microwave Landing Systems to facilitate instrument landings in all weather conditions. Pelorus has supplied over 100 of its systems to airports in North America, Southeast Asia, Europe and Australia.

#### Aircraft Maintenance and Overhaul

Northwest Industries Limited (NWI), is one of Canada's leading aircraft support companies. It provides one-stop service for aircraft repair, overhaul and modification services with advanced structures and avionics, engineering and complete Technical Publication services. At present, NWI is engaged in a long-term service contract for the Progressive Structural Inspection of Department of National Defense's C130 Hercules aircraft. The designation of NWI as the only authorized C130 Hercules Service



Centre is a recognition of the company's expertise in Hercules aircraft repair and overhaul.

#### Cold Buster Bars

Dr. Lawrence Wang, a Zoology professor at the University of Alberta, has invented a new cold buster bar, which is low-fat and high protein containing honey, densified rice and skim milk protein. Beyond its hypothermia preventing or delaying capabilities, the bar has been shown to improve exercise abilities and due to its low 154 calories, may have a place in the diet food market as well. Due to its international market potential, the bar has been patented in 11 countries.

### 6.3 Biological Sciences

#### Embryo Transfer Technology

Alta Genetics Inc. established the first commercial embryo transplant operation in the world in 1971. The company now has expanded into the international marketing of cattle semen, embryos, and purebred cattle. The major impact of embryo transfer technology in Alberta has been on the dairy industry, which in 1990, generated \$246 million in sales.

### 6.4 Biotechnology

#### Cancer Diagnosis and Immunotherapy

Biomira Inc., an Edmonton biotechnology firm, was established by two University of Alberta researchers to develop in-vitro and in-vivo cancer diagnostic and therapeutic products using monoclonal antibody technology. The commercial application of this technology is in three particular areas: (i) the diagnosis and treatment of gastrointestinal, ovary, breast and prostate cancers; (ii) radioimmunoimaging and therapy, involving the use of monoclonal antibodies to carry radioactive isotopes to the tumour site; and, (iii) active specific immunotherapy, where the "vaccines" stimulate the body's immune system to recognize and fight cancer cells.

#### Synthetic Crude from Athabasca Oil Sands

Recovery of petroleum from the Athabasca oil sands deposit required three technological innovations: economic mining of the oil sands, extraction of the raw bitumen, and the conversion of the raw bitumen to transportable and finished products. The technological achievements by two giant Alberta oil companies, namely Syncrude and Suncor Inc., in the commercialization of this product include: the development of a competitive mining system; the evaluation of bucket wheels, scrapers, and draglines; the scale-up of hot water process using commercial sized equipment; and the selection of the appropriate bitumen upgrading process, with delayed coking, fluid coking, hydrovisbreaking and hydrocracking undergoing extensive piloting.

### 6.5 Energy

#### Hazardous Waste Management

Alberta has developed the most comprehensive hazardous waste disposal system in North America - the first of its kind in Canada. In 1984, the

### 6.6 Environment

Alberta Special Waste Management Corporation (ASWMC) entered into a joint venture with Bow Valley Resources Service Ltd. to construct and manage a \$50 million Alberta Special Waste Treatment Centre. The centre receives and destroys approximately 15,000 tonnes of organic and inorganic waste annually from Alberta generators.

## 6.7 Food Processing

### Extrusion Technology

Extrusion cooking is a modern high temperature short time process in which the raw materials are mixed, moistened, developed, cooked and expelled as extrudate requiring only further drying or surface cooling to become the finished product. The Alberta Food Processing Development Centre, located in Leduc, is equipped with a twin-screw extruder cooker and works with food processors in applying this technology to a wide variety of basic research and formulation development projects. For example, a process has been developed whereby the extrudate is formed as an unexpanded pellet, which, after careful drying, can be expanded by baking or frying to produce a light, crisp product. Of particular note, the Centre has recently developed a corn crumb and hopes to market the process internationally.

## 6.8 Forest Products

### Waveboard

The Alberta Research Council has developed and patented a process and equipment for the manufacture of a corrugated wood composite panel made of wood wafers from small diameter, low quality trees. Waveboard is an inexpensive wood composite which is expected to open new markets for wood. Licenses are available and commercialization on a joint venture basis is being actively pursued.

## 6.9 Information Technology

### Airborne Synthetic Aperture Radar

Intera Information Technologies Corporation provides spatial information solutions through the collection, processing and interpretation of data using satellite, airborne, ground and subsurface survey technologies. Its international client base include the petroleum and other resource industries and government.

### UNIX System Technology

ACTC Technologies Inc. is an established Calgary based custom software engineering company which provides: (i) maintenance and customer support of proprietary operating systems for major computer companies; (ii) migration assistance from proprietary systems to open systems for customers of major computing companies; and (iii) custom application software development for governments. The company is associated with such companies as Bull HN Inc., Control Data Corporation, IBM, and Motorola Inc. ACTC has a major centre for conversion and migration to UNIX based systems. ACTC is one of the major sub-contractors for the development of TCCCS (Tactical Command, Control and Communication

System) and IRIS (Integrated Radio Intercommunication System) for Canada's Department of National Defense.

#### Spatial Systems Technology

Hughes Spatial Data Systems (HSDS), is a business unit of Hughes Aircraft of Canada Limited. It offers a range of spatial data systems related products and services. To add to its suite of services, Hughes Aircraft of Canada offers the DataPath Conversion System and Hughes STX's Stackware image processing software. Its new Calgary Electronic Facility centre will provide repair, overhaul and engineering support for Canadian Forces CF-18 aircraft airborne radar and ground-based automatic test systems.

#### Automated Window Manufacture

Gienow Building Products Ltd., has invented a computerized manufacturing system which produces windows from raw material to finished products in one sequence of operations, with essentially no inventory. The average time to complete a window is being substantially reduced, and the quality has improved to the point where it meets or exceeds national and international standards. Substantial inroads have been made into the Japanese market.

### 6.10 Manufacturing

#### Aircraft Gas Turbine Engines

Pratt & Whitney Canada has a world mandate to design, develop, manufacture, market, and support turboprop and turbo-shaft engines, small turbofan engines, and auxiliary power units. The company's new \$146 million plant in Lethbridge, Alberta will assemble its new PW 200 helicopter engine, which has been selected to power the B0108 helicopter and MDX helicopter.

#### Microbiological and Enzymological Research

SynPhar Laboratories Inc. of Edmonton, Alberta is the first-ever Canadian-Japanese pharmaceutical venture and is the first pharmaceutical research and development firm in Western Canada. It is associated with Taiho Pharmaceutical Co., Ltd., one of Japan's leading pharmaceutical firms. SynPhar's mission is to design, synthesize, and test novel pharmaceutical compounds that show potential as antibiotic, anti-viral, anti-fungal, and anti-cancer agents. Its drug development process includes acute and chronic toxicity trials, drug metabolism and pharmacokinetic studies and clinical trials in Canada and the United States. Their current research developments include areas of enzymology, immunology and molecular biology.

### 6.11 Medicine

#### Body Surface Potential Mapping

Dr. Frank Witkowsky has developed Body Surface Potential Mapping (BSPM) technology which provides data on the electrical activity of the heart. This technology is similar to electrocardiogram machines but with



much more accuracy and from many more body sites. The hardware and software system provides real time data.

## 6.12 Telecommuni- cations

### Digital Cellular Technology

TELUS Corporation was formed in 1990 as the management company for the privatized business of the Alberta Government Telephones (AGT) Commission, Canada's third largest telecommunications company. AGT Cellular Ltd., one of the subsidiaries of TELUS, has developed a new digital cellular technology which offers a higher level of security than the traditional analog system. AGT was first in Canada to offer a "Call Display" feature. Two further enhancements are "Ident-A-Call" which gives two distinctive rings on a single line and "Cancel Call Waiting" which avoids call disruption. It established the Individual Line Service Program (ILS) in 1991.

### Digital Technology

Computing Devices Company (CDC) is a pioneer in the design, development, manufacture and integration of military specification digital technology, robust telecommunications network, signal processing etc. CDC is the prime contractor for the modernization of the Department of National Defense's communications system; it will develop the Tactical Command, Control and Communication System (TCCCS) and the introduce the Integrated Radio Intercommunications System (IRIS). Its new Communications Systems Division and high-tech defense electronics procurement office in Calgary will have its own R&D and engineering capabilities.

### Leading Global Supplier

Northern Telecom (NT) Limited is the leading global supplier of fully digital telecommunications switching systems. It has two manufacturing plants in Calgary. At its private networks facility, NT manufactures the Meridian Norstar communications system; the Norstar facility is one of Canada's most advanced flexible manufacturing system. At its public networks plant, NT makes its DMS (digital multiplex system) central office switching equipment, and advanced digital cellular radio systems. In May 1992, NT announced that this plan will be expanded and complemented by a \$12 million wireless product development centre.



## 7.0 CONCLUSION

Science and technology is a driving force in Alberta, helping the province grow and prosper. Albertans have excelled at creating new goods and services and solving problems through innovation.

Alberta's most significant economic and technological accomplishments are attributed to: its skilled and productive workforce, world-class research and technology infrastructure, attractive investment climate, and a commitment to free enterprise. Alberta offers investors and entrepreneurs a competitive edge in a diverse range of industries from energy and agriculture to forestry and advanced technologies.

As the year 2000 approaches, Alberta is poised to build on this momentum to create an even stronger future out of a strong past. In order to make Alberta technology the most competitive in the global market, the Government of Alberta is committed to working in partnership with business, industry, and the scientific and educational communities.

Goals for the 1990s focus on linking advanced technology to Alberta industries and on environmentally responsible technology development. Greater emphasis will be placed on technology transfer, technology commercialization and on the role of the private sector in meeting global technological challenges. This vision commits Alberta to new dynamic partnerships, in a growing and prosperous province which will make it one of the most promising places in the world for technology investment.





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